

# CSO POST PROJECT APPRAISAL

<b>TECHNICAL NOTE REF</b>	<b>:</b>	<b>TRPM – TN003</b>
<b>AUTHOR</b>	<b>:</b>	<b>BARRY THOMPSON</b>
<b>VERSION</b>	<b>:</b>	<b>3.0</b>
<b>DATE</b>	<b>:</b>	<b>JANUARY 2016</b>

## **1.0 INTRODUCTION**

In the first decade of the new millennium, considerable investment in the UK Water Industry saw a significant number of Unsatisfactory Intermittent Discharges (UIDs) addressed, many of which were Combined Sewer Overflows (CSOs). Many of these CSOs required attention on aesthetic grounds, i.e. recognisable sewage-related debris (SRD) was discharging directly into receiving watercourses. As part of this multi-million-pound investment, screening equipment was therefore installed within thousands of existing or purpose-built CSO chambers.

Following this investment, several UK Water Companies commissioned Thompson RPM Ltd (TRPM) to conduct Post Project Appraisals on a representative sample of the CSOs constructed / commissioned.

## **2.0 CSO POST PROJECT APPRAISAL**

Collectively, over 200 CSOs were subjected to PPA. The overall objective of the exercise was to quantify progress, compliance and success with a view to seeking policy, protocol and guidance for future use.

The PPA took the form of short duration assessments conducted over a relatively short period of time. It was never the intention to conduct long term, instrumentation-based surveys examining hydraulic issues, although it is known that some Water Cos have carried out such exercises on a small number of CSOs. Instead, physical, structural, mechanical and operational aspects of the CSOs were surveyed, with particular attention focused on the new screens therein, leading to a semi-statistical analysis of the findings.

The CSO chambers were identified according to type, then assessed for compliance with relevant design guidance, location, and who was currently responsible for the site. Chamber access was assessed for vehicles, for operational personnel and in relation to screen removal and maintenance. The performance of each CSO and screen was assessed in terms of the effectiveness of operation of relief, whether there was evidence of premature operation and whether it was (where intended) self cleansing.

In addition, Operators were questioned about their general awareness of the CSO, whether site-specific training had been provided, whether a maintenance routine was in place, and if so, whether this was being implemented. The assessment of each CSO was completed with an inspection of the associated outfall, in particular looking for evidence of SRD on the receiving watercourse.

### 3.0 FINDINGS

The aim of the PPA was that the projects would yield generic findings that would feedback to design processes and thus update design guidance. These generic findings were also intended to identify where additional OP-EX was required and where additional CAP-EX could be required.

Site-specific findings were also recorded, leading to site-specific remedial 'action plans' where appropriate, or sometimes providing additions to existing or ongoing 'snagging lists'.

It soon became apparent that many CSOs were essentially unfinished, in some cases partly because of the importance given to achieving 'sign off' on substantial completion, allowing attention to refocus on different schemes elsewhere.

For example, in some instances CSOs had been accepted and commissioned before an electricity supply had been provided, which meant that some powered screens had blinded and were unable to self-cleanse. In such instances, the survey output could be more correctly described as a 'snagging' exercise rather than Post Project Appraisal, although it is hoped that the issues identified have subsequently been resolved.

Many appraisals highlighted the issue of access to CSOs being compromised. One instance included a CSO that had been "landscaped" as part of beer garden for a public house on the other side of the road. This was undoubtedly attractive, but there were issues of access (clearing the beer garden if during pub opening hours) and safety, and also possible odour complaints. In another instance, a CSO was located within a major tourist attraction (see Photograph 1), again risking safety issues and odour complaints.



**Photograph 1 – CSO within major Tourist Attraction**

A further CSO chamber was located at a traffic-light controlled junction on a major 'A' road, with access and consequently maintenance virtually impossible because of the disruption (possibly road closure and diversion) that would be entailed.

### 3.0 FINDINGS (CONT)

Other examples were found such as a CSO in a field, 200 m from the nearest road, with no water supply, no hard-standing around the manhole and no vehicular access. The lack of hard-standing around a manhole was a common finding (see Photograph 2) and was critical, as it meant that safety tripods / winches could not be used for personnel access. Under Confined Space Entry procedures, this in turn means that access for maintenance was impossible.



**Photograph 2 – No Hard-standing around CSO Personnel Access**

Several examples of basic poor installation were found. In one instance, the screen holding down fixings were clearly inadequate and the entire screen had lifted with the force of upward flow, partly demolishing the brick-built weir. At other locations, poor mechanical installation had created bypass routes (see Photograph 3) through which unscreened flow could be discharged direct to the receiving watercourse.



**Photograph 3 – Unscreened Flow Bypass due to poor Installation**

### 3.0 FINDINGS (CONT)

Retrofitting of screens to existing structures also proved problematic, with existing curved or misaligned weirs severely compromising the 6 mm x 2D standard. For example, in one instance a 25 mm gap was found between the existing weir and the frame of the 6 mm screen.

Washwater is not commonly or routinely provided to CSO screens, partly because of the problems providing such a supply to often remote locations. Some screens were noted as being prone to extreme blinding however, and in some cases attempts had been made to retro-fit a spray bar system, often with only limited success.

In one instance, washwater jet heads were installed but were not sufficiently high above the screen to wash the whole of the screen area, in another (and despite the presence of a spray bar) the only screen washing was from surface water leaking around the manhole.

At one or two locations, construction debris that the contractors had failed to remove was found on top of the screen (see Photograph 4), whilst at other locations the undersides of some screens were blinded with solids that should have cleared as flows subsided, thus compromising capacity and performance at the next storm event.



**Photograph 4 – Construction Debris left on top of Screen**

## 4.0 RESULTS

59% of the CSOs surveyed were standard (WaPUG Guide) design side weir overflows. Of these, 70% complied with that contemporary design guidance in most major respects.

Findings with regards to the various access / location issues were summarised as follows:

- 25% of the CSOs inspected were located in highways / carriageways
- 46% were located in other public spaces or private ground owned by others
- 29% were located within land owned by the relevant Water Company
- 34% of the CSOs were still under the control of the contractor on the day of the inspection
- 81% of the CSOs inspected had vehicle access within 10 m of the chamber
- 32% of the CSOs had personnel access to both sides (Continuation & Spill) of the CSO
- 46% of the CSOs required special tools (not normally carried by Operatives) to effect entry
- 46% of the CSOs inspected had full plan area access above the screen

Overall, there was restricted access to either the chamber, or the screen, or both, at 55% of the CSOs inspected. This restricted access was in turn considered likely to restrict the level of maintenance carried out.

35% of the CSOs inspected had powered screens, 62% had non-powered screens, and 3% had no screens. Of the CSOs with non-powered screens, 12% were self-cleansing and 88% were static. 37% of static screens had spray-bar cleansing systems.

The screens at only 52% of the CSOs inspected could be described as fully and correctly installed, however the screens at 95% of the CSOs could be described as being in 'good' condition mechanically / structurally.

'Performance Indicators' for the CSO / screen combination were derived, including evidence of flows over-topping the screen, an assessment of whether the CSO appeared to be able to provide the intended relief function when required (i.e. no blockages) and an assessment of whether screens intended to be self-cleansing were actually achieving this function.

Based on these performance indicators, the performance of 43% of the CSO / screen combinations inspected were found to be 'acceptable', 45% were found to be 'average', and 12% were found to be 'unacceptable'.

Operatives present on the day of inspection at only 28% of the CSOs were fully aware of the operation of the overflow, and had received appropriate training. Some Operatives met had never been to the site before the day of inspection. Routine, planned preventative maintenance was found at 62% of the CSOs and in these cases it was generally being adhered to.

Evidence of Sewage Related Debris (SRD) was found in the receiving watercourse or adjacent to the outfall structure at 50% of the CSOs inspected, although it was possible that some of this debris could be 'historic', i.e. already in or adjacent to the watercourse prior to the commissioning of the new CSO / screen.

## 5.0 SUMMARY

The above findings were generally summarised as follows:

*Location / Access* – Location was generally driven by circumstance, there was often little choice, but design guidance / policy would have been useful regarding access, ladders, etc.

*Hand-Over* – This was found to be a grey area, with contract documents often failing to identify procedures sufficiently. The potential for standardisation, or at least for improvement by adopting good contracting practice, was identified.

*Installation / Commissioning* – Improved liaison between parties was identified as being required, ownership needed to be defined and the hand-over needed to be improved.

*Equipment Selection / Standardisation* – It was noted that standardisation would not address all Water Company / End User needs, and could stifle innovation.

*Operation & Maintenance* – There was not enough specific training, maintenance was reasonable but service levels were expected to deteriorate as more screens were installed without the commensurate increase in personnel.

*Post Project Appraisal* – This was often neglected, and responsibility was confused. PPA was often not included in scheme budgets thus there were funding issues. It was identified that standard procedures based on existing work (UKWIR, YW, UU, TRPM) would be useful.